CHAPTER 1

HULLESS BARLEY

INDEX

MONTANA STANDARDS FOR HULLESS BARLEY

1.1 – GRADE AND GRADE REQUIREMENTS

Hulless barley is divided into three classes based on kernel characteristics and quality. Hulless Waxy Barley and Hulless Barley are divided into three numerical grades. Feed Hulless Barley is divided into three numerical grades and sample grade. Special grades are provided to emphasize special qualities or conditions affecting the value of the Hulless Barley. Special graces are added to and made a part of the grade designation. They do not effect the numerical or sample grade designation.

Table No. 1 – Hulless Waxy Barley

	Minimum limits of -		Maximum limits of –			
Grade	Hulless Waxy Barley Percent	Sound Hulless Waxy Percent	Foreign Material Percent	Heat Damage Percent	Damaged Kernels (Total) 1/ Percent	Non-Barley Material 2/ Percent
MT NO.1	98.0	97.0	0.5	0.2	2.0	1.0
MT NO.1	97.0	96.0	1.0	0.2	3.0	2.0
MT NO.1	97.0	95.0	2.0	0.5	5.0	3.0

1/ Includes Heat-damaged kernels.
2/ Includes Foreign Material, Other Grains and Dockage.

The following factors shall be recorded on all certificates regardless of grade: Adherent Hulls, Broken Kernels, Conventional Barley, Identify Damaged Kernels, Dockage, Moisture Sound Hulless Barley, Stones, Test Weight Per Bushel, Thin and Plump Hulless Barley, Wild Oats, and Variety.

Table No. 2 – Hulless Waxy Barley

	Minimum limits of -		Maximum limits of –			
Grade	Hulless Waxy Barley Percent	Sound Hulless Waxy Percent	Foreign Material Percent	Heat Damage Percent	Damaged Kernels (Total) 1/ Percent	Non-Barley Material 2/ Percent
MT NO.1	98.0	97.0	0.5	0.2	2.0	1.0
MT NO.1	97.0	96.0	1.0	0.2	3.0	2.0
MT NO.1	97.0	95.0	2.0	0.5	5.0	3.0

1/ Includes Heat-damaged kernels.
2/ Includes Foreign Material, Other Grains and Dockage.

The following factors shall be recorded on all certificates regardless of grade: Adherent Hulls, Broken Kernels, Conventional Barley, Identify Damaged Kernels, Dockage, Moisture Sound Hulless Barley, Stones, Test Weight Per Bushel, Thin, and Plump Hulless Barley, Wild Oats, and Variety.

Table No. 3 – Hulless Waxy Barley

	Minimum limits of -		Maximum limits of –			
Grade	Test Weight Per Bushel Percent	Hulless Waxy or Hulless Percent	Foreign Material Percent	Heat Damage Percent	Heat Damage Percent	Damaged Kernels (Total) 1/ Percent
MT NO.1	48.0	95.0	95.0	2.0	2.0	5.0
MT NO.1	46.0	90.0	90.0	5.0	5.0	10.0
MT NO.1	43.0	80.0	80.0	10.0	10.0	20.0

MT Sample Grade… MT Sample Grade shall be hulless barley which –

A. Does not meet the requirements for MT.NO. 1, 2, or 3; or
B. Contains 5 or more insect damaged kernels per 100 grams; or
C. Contains 1 or more pieces of glass, 3 or more crotalaria seeds, 2 or more castor beans, 4 or more cocklebur or similar seeds singly or in combination; or
D. Contains two or more rodent pellets, bird droppings, or an equivalent quantity of other animal filth, two or more particles of an unknown foreign substance, or a commonly recognized harmful or toxic substance(s) per 1-1/8 to 1-1/4 quarts of hullesss barley; or
E. Has a Musty, Sour, or commercially Objectionable Foreign Odor (Except Smut); or
F. Is heating or otherwise distinctly low quality.

1/ Includes Heat Damaged Kernels.
Sprouted kernels are not considered as Damage in Feed Hulless Barley and will not count against Sound or be included in Damaged Kernels (Total).

The following factors shall be recorded on all certificates regardless of grade: Adherent Hulls, Broken Kernels, Conventional Barley, Identify Damaged Kernels, Dockage, Moisture, Sound Hulless Barley, Stones, Test Weight Per Bushel, Thin and Plump Hulless Barley, Wild Oats, and Variety.

1.2 –GRADE DESIGNATIONS

Use the following guidelines when signing grades on pan tickets and certificates.

A. The abbreviation “MT”.

B. The abbreviation “NO.” and the number of the grade or the words “Sample Grade”;

C. The applicable special grade(s) in alphabetical order;

D. The word “dockage” and the percentage thereof.

In addition, include the following on the pan ticket and in the “Remarks” section of the certificate.

A. When applicable, the number of insect-damaged kernels.

B. When applicable, the percentage of protein.

C. Record the number of stones.

1.2 – PERCENTAGES

Determine percentages on a weight basis to a nearest tenth percent except for class, kind of grain, plump, and ergot. Report ergot to the nearest hundredth percent. The percentage when determining plump, the kind of grain and class in hulless barley is recorded to the nearest whole percent. Calculate percents by dividing the weight of the material removed by the weight of the portion used and multiplying by 100.

Table No. 4 – How Factors Are Recorded

NEAREST WHOLE PERCENT	NEAREST TENTH PERCENT	NEAREST HUNDREDTH PERCENT	BY COUNT
Class Kind of Grain Plump Hulless Barley	Adherent Hulls Broken Kernels Conventional Barley Damaged Kernels (Total) Dockage Foreign Material Heat-Damaged Kernels Moisture Non-Barley Material Other Grain Sound Hulless Barley Test Weight Per Bushel Thin Hulless Barley Wild Oats	Ergot	Animal Filth Castor Beans Cockleburs Crotalaria Seeds Garlic Bulblets Glass Insects Large Debris Smut Stones Unknown Foreign Substance(s) or a Commonly Recognized Harmful or Toxic Substance(s)

1.4 – BASIS OF DETERMINATION

Distinctly Low Quality. The determination of distinctly low quality is made on the basis as a lot as a whole at the time of sampling when a condition exists that may or may not appear in the representative sample and/or the sample as a whole.

Certain Quality Determinations. Each determination of rodent pellets, bird droppings, other animal filth, broken glass, castor beans, cockleburs, crotalaria seeds, dockage, live insect infestation, large stones, moisture, temperature, garlic and unknown foreign substance(s), and a commonly recognized harmful toxic substance(s) is made on the basis of the sample as a whole. When a condition exists that may not appear in the representative sample, the determination may be made on the basis of the lot as a whole at the time of sampling.

All Other Determinations. Other determinations not specifically provided for under the general provisions are made on the basis of grain when free from dockage, except the determination for odor is made on either the basis of grain as a whole or the grain when free from dockage.

Table No. 5 – Basis of Determination

FACTORS DETERMINED BEFORE THE REMOVAL OF DOCKAGE	FACTORS DETERMINED ON PEARLED PORTION AFTER THE REMOVAL OF DOCKAGE	FACTORS DETERMINED AFTER THE REMOVAL OF DOCKAGE
Animal Filth	Heat-Damaged Kernels	Adherent Hulls
Castor Beans		Broken Kernels
Cockleburs		Class
Crotalaria Seeds		Damaged Kernels (Total)
Garlic Bulblets		Ergot
Glass		Foreign Material
Heating		Heat-Damaged Kernels
Infested		Odor
Kind of Grain		Other Grains
Large Debris		Plump Hulless Barley
Moisture		Sound Hulless Barley
Odor		Smut
Other Unusual Conditions		Stones
Unknown Foreign Substance(s) or a Commonly Recognized Harmful or Toxic Substance(s)		Test Weight Per Bushel
		Thin Hulless Barley
		Wild Oats

A general procedure based on the "basis of determination" definition is followed in the inspection and grading of hulless barley. However, the procedure may vary according to the test required to determine the grade. The following sections of this chapter are arranged in a logical sequence typically followed in the inspection and grading of hulless barley.

1.5 – DEFINITION OF HULLESS BARLEY

Grain which, before the removal of dockage consists of 80 percent or more of hulless or conventional barley and not more than 20 percent of other grains for which standards have been established under the United States Grain Standards Act or Montana standards. The term "hulless barley" as used in these standards shall include all types and varieties of hulless barley.

1.6 – CLASSES

Hulless barley is divided into three classes.

1. HULLESS WAXY BARLEY. Hulless waxy barley of the waxy barley types which contains not more than 3.0 percent of hulless barley or conventional barley, either single or combined.

2. HULLESS BARLEY. Hulless barley of the hulless barley types which contains no more than 3.0 percent of hulless waxy barley or conventional barley, either singly or combined.

3. FEED HULLESS BARLEY. Hulless waxy barley or hulless barley which does not meet the grade requirements of Montana Number 1, 2, or 3 of hulless waxy barley or hulless barley.

1.7 – HEATING

Hulless Barley developing a high temperature from excessive respiration is considered heating. Heating hulless barley, in its final stages, will usually have a sour or musty odor. Care should be taken not to confuse hulless barley that is heating with hulless barley that is warm and moist because of storage in bins, railcars, or other containers during hot weather.

Basis of Determination. Determine heating on evidence obtained at the time of sampling.

Certification. Grade heating hulless barley MT Sample Grade and record the work "Heating" on the pan ticket and in the "Remarks" section of the certificate.

1.8 – ODOR

Basis of Determination. Determine odor on evidence obtained at the time of sampling and on the sample either before or after the removal of dockage.

Table No. 6 – Odor Classification Examples

SOUR	MUSTY	COMMERCIALLY OBJECTIONABLE FOREIGN ODORS
Boot	Ground	Animal hides
Fermenting	Insect	Decaying animal & vegetable matter
Insect (acrid)	Moldy	Fertilizer
Pigpen		Fumigant
Smoke a/		Insecticide
		Oil products
		Skunk
		Smoke (evidence of fire-burnt material)
		Strong weed

a/ Consider smoke odors as sour unless there is evidence of fire-burnt material.

Musty or Sour Odors. High temperatures resulting from excessive respiration cause hulless barley to heat and give off a Musty or Sour odor.

Musty or sour odor in hulless barley includes musty, sour, earthy, moldy, ground odor; or a rancid, sharp, and acrid insect odor. An acrid insect odor (usually referred as "lesser grain borer" odor) is considered sour. An insect odor other than acrid (usually referred to as "bran bugs" odor) is considered musty.

Commercially Objectionable Foreign Odor. Commercially objectionable foreign odor are odors, except smut, that are foreign to grain and render it unfit for normal commercial usage.

Fumigant or insecticide odors are considered commercially objectionable foreign odors if they linger and do not dissipate. When a sample of hulless barley contains fumigant or insecticide odor that prevents a determination as to whether any other odor(s) exists, apply the following guidelines:

A. Allow the sample to aerate in an open metal container not to exceed four (4) hours; and

B. If the fumigant odor persists after four (4) hours, consider the sample as having a commercially objectionable foreign odor and grade it accordingly.

Certification. Grade hulless barley containing a musty, sour or commercially objectionable foreign odor as MT Sample Grade. Record the words "Musty", "Sour", or "Commercially Objectionable Foreign Odor" on the pan ticket and on the certificate.

1.9 – MOISTURE

Water content in grain as determined by an approved device.

Basis of Determination. Determine moisture by oven method or any other method which gives equivalent results. Moisture determination shall be made on a representative portion of the original sample before the removal of dockage.

Certification. Record the percentage of moisture on the pan ticket and the certificate to the nearest tenth percent.

1.10 – DISTINCTLY LOW QUALITY

Consider hulless barley distinctly low quality when it is obviously of inferior quality and the existing grade factors or guidelines do not properly reflect the inferior condition.

Basis of Determination. Use all available information to determine whether the hulless barley is of distinctly low quality. Determine distinctly low quality on the lot as a whole or the sample as a whole.

Large Debris. Hulless barley containing two or more stones, pieces of glass, pieces of concrete, or other pieces of wreckage or debris which are visible to the sampler and too large to enter the sampling devise is considered distinctly low quality.

Other Unusual Conditions. Hulless barley that is obviously affected by other unusual conditions (including diatomaceous earth) which adversely effects the quality of the hulless barley and can not be properly graded by use of the grading factors specified or defined in the standards is considered distinctly low quality.

Certification. Grade distinctly low quality hulless barley as MT Sample Grade. Record the word "Distinctly Low Quality" and the reason(s) why on the pan ticket and on the certificate.

1.11 – DOCKAGE

All matter other than hulless and conventional barley that can be removed from the original sample by use of an approved device. Also, under developed, shriveled and small pieces of hulless and conventional barley kernels removed in properly separating the material other than hulless and conventional barley that cannot be recovered by properly rescreening or recleaning.

Basis of Determination. Determine dockage on a portion of approximately 1-1/8 to 1-1/4 quarts.

Determining Dockage with the Carter Dockage Tester. Set up the Carter dockage tester as follows:

A. Set the air control at Number 4.

B. Set the feed control at Number 6.

C. Use a Number 6 riddle in the riddle carriage.

D. Use a Number 8 sieve in the top sieve carriage.

E. Use a number 6 sieve in the middle sieve carriage.

F. Use no sieve in the bottom sieve carriage.

If the material that passed over the Number 6 sieve (middle collection pan) contains more than 0.1 percent mustard seed, wild buckwheat, or similar size seed, rescreen with a hand sieve as follows:

A. Use a 5/64-inch equilateral triangular hole sieve and bottom pan.

B. Place the material that passed over the Number 6 sieve on the upper edge of the 5/64-inch sieve.

C. Hold the sieve at a 10- to 20-degree angle and work the material down over the sieve with a gentle side-to-side motion.

D. Hulless, conventional barley and other material remaining on top of the sieve shall be returned to the cleaned hulless and conventional barley that passed over the Number 8 sieve (top collection pan).

E. All material that passed through the 5/64-inch hand sieve shall be considered dockage.

Dockage will then consist of:

A. The material removed by the aspirator (air collection pan).

B. The coarse material, other than hulless barley and conventional barley, that passed over the riddle (riddle collection pan).

C. The material tat passed through the Number 6 sieve (bottom collection pan).

D. The material that passed through the 5/64-inch hand sieve.

To avoid repeating operations, check the dockage for live weevils and other insects injurious to store grain and sample grade factors. Live weevils and other live insects injurious to stored grain and sample grade factors are considered dockage but, when present in excessive quantities, are also considered in the determination of the special grades "Infested," and "MT Sample Grade" as the case may be.

Certification. Record the percentage of dockage on the pan ticket and the certificate to the nearest tenth percent.

1.12 – TEST WEIGHT PER BUSHEL

The weight per Winchester bushel (2, 150. 42 cubic inches) as determined using an approved device.

Basis of Determination. Determine test weight per bushel on a dockage-free portion ranging in size from 1-1/8 to 1-1/4 quarts.

Certification. Record test weight per bushel on the pan ticket and the certificate to the nearest tenth percent.

1.13 – MONTANA SAMPLE GRADE

Basis of Determination. Determine MT Sample Grade factors, before the removal of dockage on the lot as a whole and/or a portion of approximately 1,000 to 1,050 grams. When a condition exists that may not appear in the sample, the determination may be made at the time of sampling. Table No. 7 shows the factors and corresponding line slides, tolerances and the appropriate basis of determination.

Table No. 7 – MT. Sample Grade Factors

FACTOR	LINE SLIDE	NUMBER/WEIGHT LIMITS 1/	BASIS
Any Grading Factor		Excess of Limit for MT NO. 3	Sample
Animal Filth	OF-1.0	2 or more	Lot/Sample
Castor Beans	OF-3.0	2 or more	Lot/Sample
Cockleburs	OF-6.0	4 or more	Lot/Sample
Crotalaria Seeds 2/	OF-8.0	3 or more	Lot/Sample
Diatomaceous Earth*		Presence	Lot/Sample
Glass		1 or more	Lot/Sample
Heating		Presence	Lot
Insect-Damaged		See Section 1.26	Lot/Sample
Large Debris*		2 or more	Lot/Sample
Odor		Presence	Lot/Sample
Other Unusual Conditions*		Presence	Lot/Sample
Unknown Foreign substance(s) or a commonly recognized harmful or toxic substance(s) 3/	OF-31.0	2 or more	Lot/Sample

1/ Record count factors to the nearest whole number.
2/ Do not confuse crotalaria seeds with velvet leaf seeds which are not harmful to animal life (ILS OF-8.1).
3/ Includes pelletized material other than feed pellets which are considered foreign material.

* For Distinctly Low Quality, see section 1.10

Certification. Grade hulless barley MT Sample Grade when one or more of the limits in Table 7.0 are exceeded. Record the reason(s) why on the pan ticket and in the "Remarks" section of the certificate.

1.14 – SPECIAL GRADES AND SPECIAL GRADE DESIGNATIONS

Special grades draw attention to unusual conditions in the grain and are made part of the grade designation.

The definitions and examples of the designations for special grades in hulless barley are:

A. ERGOTY HULLESS BARLEY. Hulless barley that contains more than 0.05 percent ergot.

Example: MT. NO. 3 Hulless Waxy Barley, Ergoty, Dockage 1.2%

Ergot is hare, reddish-brown or black grain-like mass of certain parasitic fungi that replaces the kernels of hulless barley.

Basis of Determination. Determine ergoty on a dockage-free portion of approximately 250 grams. Ergot also functions as foreign material.

Certification. When applicable, record the word "Ergoty" on the pan ticket and the certificate in accordance with Section 1.2, Grade Designations. Record the percentage of ergot to the nearest hundredth percent on the pan ticket and in the "Remarks" section of the certificate.

B. GARLICKY HULLESS BARLEY. Hulless barley that contains in a 1,000 gram portion more than two green garlic bulblets or an equivalent quantity of dry or partially dry bulblets.

Example: MT. NO. 2 Hulless Waxy Barley, Garlicky, Dockage 0.7%

Basis of Determination. Determine garlicky before the removal of dockage on a portion of approximately 1,000 grams except in those cases where the garlic bulblet count is in excess of ten green bulblets. When garlic bulblets are in excess of ten green bulblets on the 250 gram portion, multiply the count by four to obtain the equivalent number of bulblets in 1,000 grams.

Characteristics of Bulblets.

A. Green garlic bulblets are bulblets which have retained all of their husks intact.

B. Dry or partly dry garlic bulblets are bulblets which have lost all or part of their husks. Consider bulblets with cracked husks as dry.

C. Three dry or partly dry garlic bulblets are equal to one green bulblet. Garlic bulblets apply in the determination of garlicky but also function as dockage or foreign material as the case may be. (Reference: Interpretive Line Side No's OF-13.0 and OF-13.1).

Certification. When applicable, record the word "Garlicky" on the pan ticket and the certificate in accordance the Section 1.2, Grade Designations. Record the number of garlic bulblets in whole and thirds on the pan ticket and the "Remarks" section of the certificate.

C. INFESTED HULLESS BARLEY. Hulless barley that is infested with live weevils or other live insects injurious to stored grain.

Example: MT. No. 1 Hulless Barley, Infested, Dockage 0.0%

The presence of any live weevil or other live insects injurious to stored grain found in the work sample indicates the probability of infestation and indicates that the hulless barley must be carefully examined to determine if it is infested. In such cases, examine the work sample and the file sample before reaching a conclusion as to whether or not the hulless barley is infested. Do not examine the file sample if the work portion is insect free.

Live weevils shall include rice weevils, granary weevils, maize weevils, cowpea weevils and lesser grain borers. Other live insects injurious to stored grain shall include grain beetles, grain moths, vetch bruchids, and larvae.

Basis of Determination. Examine for insects before the removal of dockage.

For specific guidelines, see tables 8 and 9.

Certification. When applicable, record the word "Infested" on the pan ticket and certificate in accordance with Section 1.2, Grade Designation.